

PHORETIC MITE AND NEMATODE ASSOCIATES OF THE SPRUCE BARK BEETLE, *Ips typographus* (COLEOPTERA: SCOLYTIDAE) IN GEORGIA



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BACKGROUND

The spruce bark beetle, *Ips typographus*, is a very important pest of oriental spruce (*Picea orientalis* L.) in the coniferous forests of Georgia. When beetle populations are high, they can rapidly attack and kill healthy and vigorous trees. In the Borjomi gorge where the coniferous forest exceeds 16,677 ha, damage to spruce stands by this pest averages 20% (Figures 1 and 2). The Baku-Tbilisi-Ceyhan pipeline which crosses the Georgian-Turkey borders has been a significant source of felled trees and slash for the spruce bark beetle to feed upon and increase in numbers. As a result of the pipeline construction, an outbreak of *I. typographus* and other bark beetles has occurred in the conifer forests which stretch along these borders.

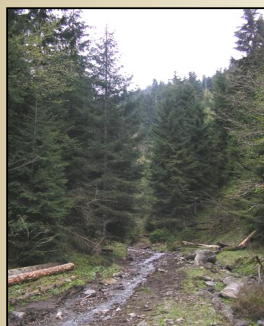


Figure 1. *Picea orientalis* damage by *I. typographus* in the Borjomi-Bakuriani region.



Figure 2. Location of the study area in the Borjomi-Bakuriani Region of Georgia.

MATERIALS AND METHODS

Mites associated with *Ips typographus* were surveyed from infested spruce trees in October and November of 2005 and in March and May of 2007 from trees of different sampling plots in the Borjomi-Bakuriani region (Figure 2).

Bark beetle adults were collected by hand from infested log sections of oriental spruce trees. In addition, log sections from infested spruce trees were cut from various sections of the forest, and their heights, diameters, ages, and dates noted when they were felled. Also tallied for each tree were the number of beetles collected from beetle galleries, and the number of vials containing 70% alcohol into which the beetles were placed. Those beetles carrying phoretic mites were then recorded each year from sampling plots from the four districts.

Table 1. Summary of mites associated with 11 males and 17 females sampled from galleries of *Ips typographus* in *Picea orientalis* in 2005.

Mite Species	Stages Collected	On Beetle	Locations of Mites on Beetle or in the Sediments	LPS*	AS*	Total	% of All Mites Collected
<i>Histiostoma picea</i> Scheuchzer	Deutonymph	8	Under elytra, ventral abdomen, ventral thorax	5	18	31	18.3
<i>Dendrolaelaps quadrisetus</i> (Berlese)	Deutonymph Female Male	12	Under elytra, ventral abdomen, ventral thorax, dorsal thorax, coxa, head	13	48	73	43.2
<i>Dendrolaelaps apophyseus</i> Hirschmann	Female	0	Sediments	0	2	2	1.2
<i>Ereynetes propescutulis</i>	Female Male	0	Sediments	0	18	18	10.6
<i>Trichouropoda polytricha</i> (Vitzthum)	Deutonymph Protonymph	0	Sediments	3	10	13	7.7
<i>Urobovella ipidis</i> (Vitzthum)	Deutonymph	0	Sediments	0	1	1	0.6
<i>Histiogaster ornatus</i> Volgin	Female Male	0	Sediments	0	31	31	18.3
Totals		20		21	128	169	

Table 2. Summary of mites phoretic on 28 males and 32 females of *Ips typographus* sampled from galleries of *Ips typographus* in *Picea orientalis* in 2007.

Mite Species	Phoretic Stage	On Beetle	Locations of Mites on Beetle or in the Sediments	Alcohol Sediments	Total	% of All Mites Collected
<i>Histiostoma picea</i>	Deutonymph	77	Under elytra, ventral abdomen, ventral thorax	2	79	14.7
<i>Dendrolaelaps quadrisetus</i>	Deutonymph	284	Under elytra, ventral abdomen, ventral thorax, dorsal thorax, coxa, head	70	354	66.0
<i>Trichouropoda</i> sp.	Deutonymph	79	Sediments	3	82	15.3
<i>Uropodidae</i> sp.	Deutonymph	17	Dorsal thorax	0	17	3.2
<i>Ipomemus</i> sp.	Female	0	Sediments	1	1	0.2
<i>Paraleilus leontonychus</i> (Berlese)	Female, Male	3	Ventral thorax	-	3	0.6
Totals		460		76	536	

RESULTS AND DISCUSSION

A total of 520 specimens of *Ips typographus* and *Dendroctonus micans* were taken from the inner and outer bark of *Picea orientalis* that were felled and sampled in 2005 and 2007. Of the 520 collected beetles, only two were *D. micans*, which were from the Tcagveri District and carried no mites.

At least 10 species of mites were located with *Ips typographus* in Georgia (Tables 1 and 2). The most abundant mite species was *Dendrolaelaps quadrisetus* (43.2-66%), *Histiostoma piceae* (14.7-18.3%), *Histiogaster ornatus* (18.3%) and *Ereynetes propescutulis* (10.6%). The following species were much less common: *Trichouropoda polytricha* (7.7%), *Dendrolaelaps apophyseus* (1.2%), *Urobovella ipidis* and *Paraleilus leontonychus* (0.6%). In addition to the 10 identified species in Table 4, several specimens were too damaged, and could only be identified as *Trichouropoda* sp. (15.3%), *Uropodidae* sp. (3.2%), and *Ipomemus* sp. (0.2%).

Different mite species of bark beetles were located on different body sites of *Ips typographus*. Some species were consistently seen on certain locations. Deutonymphs of *H. piceae* (Figure 3a) were found under the elytra, ventral abdomen, and ventral thorax, while deutonymphs of *D. apophyseus* and *Trichouropoda polytricha* (Figure 3b) were taken only from under the elytra and dorsal thorax. Although numerous deutonymphs of the most abundant species, *D. quadrisetus* (Figure 3c), were mostly under the elytra, some were also attached to other areas of the beetle's body.

We found nematodes *Bursaphelenchus* sp. (Tylenchida: Aphelenchoididae) (Figure 3c) and *Parasitorhabditis subelongati* Slobodjanjuk (Rhabditida: Rhabditidae) in fat tissue, gut, on the body surface, under elytra, and in the galleries of *Ips typographus*. *Bursaphelenchus* sp., a facultative ectoparasite, occurred only under the elytra. About 50-100 nematode specimens were taken from 70-90% of bark beetles. *P. subelongati* was seen in the gut and hemolymph of beetles. Sexually mature forms were found in the gallery of the spruce bark beetle during the months of October and November 2005. Infection rates were 2-5%.



Figure 3. Location of phoretic mites on the bodies of *Ips typographus*: a - Hp - *Histiostoma piceae*; b - T. sp - *Trichouropoda* sp.; c - B. sp. - *Bursaphelenchus* sp., Dq - *Dendrolaelaps quadrisetus*.